Small Business Innovation Research/Small Business Tech Transfer

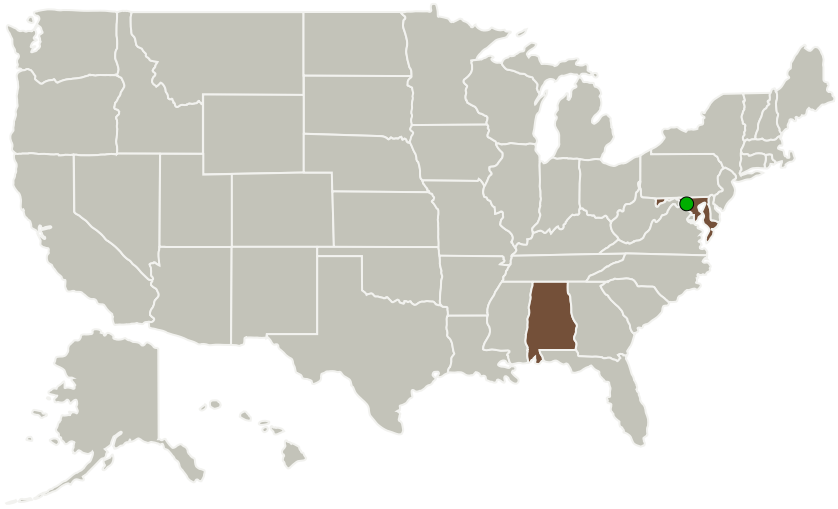
Development of Diamond Vacuum Differential Amplifier for Harsh Environment Power Electronics, Phase I

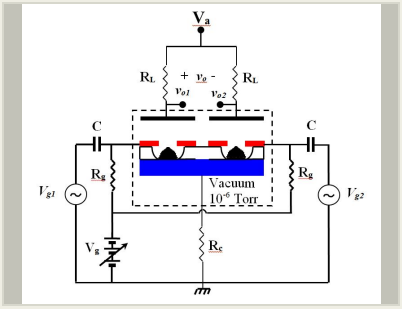
Completed Technology Project (2016 - 2016)

Project Introduction

Scientic, Inc., in collaboration with Vanderbilt University, proposes to develop a novel vacuum field emission differential amplifier (VFEDA) using low electron affinity nanodiamond (ND) material as electron emitters for high-power electronic application in harsh environments. The ND VFEDA is a fundamental circuit building block for vacuum integrated circuits (VICs) ideally suited for space applications. The proposed high-power nanodiamond-based VFEDA will be capable of operating over a wide-temperature range (-125 C to 450 C), possess tolerance to extreme doses of ionizing radiation and deliver the long-term reliability and stability needed to successfully execute environmentally stressful space science missions. Successfully developed, the proposed innovation will enhance NASA?s ability to reliably power spacecraft subjected to the harsh rigors of space, as-well-as autonomous systems engaged in the surface exploration of icy moons or operating in the high-temperature/high radiation environments of other solar bodies. It also has the potential to provide power components for nanosats and cubesats, thus improving the performance of systems engaged in near-Earth space science missions.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Scientic, Inc.	Lead Organization	Industry	Huntsville, Alabama
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Alabama	Maryland

Project Transitions

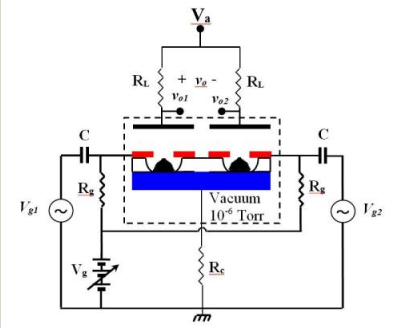
June 2016: Project Start

December 2016: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139625)*

Images



Briefing Chart Image
Development of Diamond Vacuum Differential Amplifier for Harsh Environment Power Electronics, Phase I
(https://techport.nasa.gov/image/129127)

Final Summary Chart Image
Development of Diamond Vacuum Differential Amplifier for Harsh Environment Power Electronics, Phase I Project Image
(https://techport.nasa.gov/image/127539)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Scientic, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

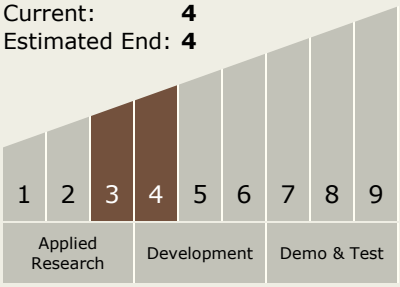
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Steven Renfrow

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.3 Power Management and Distribution
    - TX03.3.4 Advanced Electronic Parts

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System